Title: Optimization in energy problems

Author: Matouš Fürst

Department: Department of Probability and Mathematical Statistics

Supervisor: doc. RNDr. Ing. Miloš Kopa, Ph.D., Department of Probability and Mathematical Statistics

Abstract: In this thesis we present an optimization model of a semi-autonomous household, which aims to make energy management more efficient. The household is equipped with solar panels and an electric vehicle with a high-capacity battery. In the first part we summarize the basic properties of linear programming and two-stage stochastic linear programming. Subsequently, a two-stage stochastic linear program is formulated and solved in order to optimize the purchase, sale and storage of energy in the household during a single day. The program is formulated in two versions — with present and with departing vehicle. The final solution represents optimal decisions of the household and we discuss it with respect to the input data. In both versions the solution leads to a substantial reduction in costs compared to a household without a battery.

Keywords: stochastic optimization, linear programming, domestic microgrid